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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/881,782	06/18/2001	Takashi Udagawa	Q61741	1610

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EXAMINER	
BROCK II, PAUL E	

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 11/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/881,782	UDAGAWA, TAKASHI	
	Examiner	Art Unit	
	Paul E Brock II	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 September 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *8-10 and 18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,11-17,19 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *25 October 2002* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *21* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

1. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

For example, at least on pages 6 – 11 of the originally filed specification, there are a plurality references listed, however, they are not listed on any information disclosure statements which have been filed.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1 – 7, 11 – 17, 19, and 20 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claims 1, 11, and 19 recite the limitations "the surface of the region other than the projective region" and "the surface of the group-III nitride crystal layer" in the last four lines of

all of these claims. There is insufficient antecedent basis for this limitation in the claim. While it is unclear what defines these features, for purposes of this office action "the surface of the region other than the projective region" will be considered -- a surface of a region other than a projective region --.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1 – 3 and 6, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ming-Jiunn et al. (USPAT 6078064, Ming-Jiunn) in view of Ohba et al. (USPAT 5076860, Ohba), Lee et al. (USPAT 5789768, Lee), and Okazaki et al (USPAT 5977566, Okazaki).

With regard to claim 1, Ming-Jiunn discloses in figure 7 a group-III nitride semiconductor light-emitting diode comprising at least a first conduction-type single crystal substrate (52) provided with a first conduction-type back-surface ohmic electrode (19) on a back surface thereof, a buffer layer (16) on a front surface of the single crystal substrate, a gallium nitride (GaN)-based group-III nitride crystal layer (13/14) having a light-emitting part of hetero-junction structure on the buffer layer, and a window layer (11b) comprising an electrically conducting transparent oxide crystal layer on the group-III nitride crystal layer, wherein at least a second conduction-type surface ohmic electrode (42) conductive with the window layer is between the surface of the group-III nitride crystal layer and the window layer and comes into

contact with the surface of the group-III nitride crystal layer and a whole pad electrode for wire bonding is on the center of the upper surface of the window layer. Ming-Jiunn does not teach that the buffer layer comprises a boron phosphide (BP)- based material. Ohba teaches in figure 13 a buffer layer (62) comprising a boron phosphide (BP)-based material on a front surface of a single crystal substrate (61). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the boron phosphide buffer layer of Ohba in the device of Ming-Jiunn in order to form an indirect transition buffer layer as stated by Ohba in column 11, lines 30 – 35. Ming-Jiunn and Ohba do not teach that the second conduction –type surface ohmic electrode is disposed on a region other than the projective region and that the window layer covers and is in contact with the surface of the group-III crystal layer on the entire projective region of the pad electrode. Lee teaches in figure 5a, and column 4, lines 59 – 20 a second conduction-type surface ohmic electrode (58) is disposed on the surface of a region other than a projective region of the pad electrode on a group-III crystal layer, and a window layer covers and is in contact with the surface of the group-III crystal layer on the entire projective region of the pad electrode. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the electrode at a position other than the projective region and the window layer in contact with the crystal layer on the entire projective region in the group III nitride crystal device of Ming-Jiunn and Ohba in order to form a schottky barrier having good current blocking capability and therefore contribute to higher power output as stated by Lee in column 4, line 59 – column 5, line 20. Ming-Jiunn, Ohba, and Lee do not teach that the second conduction type-surface ohmic electrode is comprised of a plurality of electrodes. Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 a second

conduction-type surface ohmic electrode (45) composed of a plurality of electrodes which are disposed on a surface of a region other than the projective region of the pad electrode on a group III nitride crystal layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the second conduction type surface ohmic electrode of Okazaki in the method of Ming-Jiunn, Ohba and Lee in order to scatter the current and therefore emit more light than the prior art as stated by Okazaki in column 6, lines 7 – 10 and 49 – 53.

With regard to claim 2, Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 wherein the second conduction-type surface ohmic electrodes are disposed in a periphery of the pad electrode.

With regard to claim 3, Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 wherein the second conduction-type surface ohmic electrodes are disposed at a bilaterally symmetric position with respect to the center of the pad electrode.

With regard to claim 6, Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 wherein the second conduction-type surface ohmic electrodes are is disposed in an open light-emitting region other than a projective region of the pad electrode on the surface of the group-III nitride crystal layer.

With regard to claim 7, Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 wherein the sum of areas of second conduction-type surface ohmic electrodes is from 5 to 30% of a total area of the open light-emitting region.

7. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ming-Jiunn, Ohba, Lee, and Okazaki as applied to claim 1 above, and further in view of Bastek (USPAT 4232440).

It is not clear if Ming-Jiunn, Ohba, Lee and Okazaki teach wherein the second conduction-type surface ohmic electrodes are disposed at isometric positions from the center of the pad electrode. Bastek teaches in figure 3 wherein a second conduction-type surface ohmic electrodes (16) are disposed at isometric positions from the center of a pad electrode (15). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the positioning of Bastek in the device of Ming-Jiunn, Ohba, Lee, and Okazaki in order to make contact to a light emitting portion of a light emitting device with a high degree of reliability and with minimum interference with light emission.

8. Claims 11 – 13, 16, 17, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ming-Jiunn in view of Lee and Okazaki.

With regard to claim 11, Ming-Jiunn discloses in figure 7 an electrode for group-III nitride semiconductor light-emitting diodes for a group-III semiconductor light-emitting diode comprising at least a gallium nitride (GaN)-based group-III nitride crystal layer (13/14) having a light-emitting part of hetero-junction structure, and a window layer (11b) comprising an electrically conducting transparent oxide crystal layer provided on the group-III nitride crystal layer, wherein at least a surface ohmic electrode (42) conductive with the window layer is between the surface of the group-III nitride crystal layer and the window layer and comes into contact with the surface of the group-III nitride crystal layer and a whole pad electrode for wire

bonding is disposed on the center of the upper surface of the window layer. Ming-Jiunn does not teach that the second conduction –type surface ohmic electrode is disposed on a region other than the projective region and that the window layer covers and is in contact with the surface of the group-III crystal layer on the entire projective region of the pad electrode. Lee teaches in figure 5a, and column 4, lines 59 – 20 a second conduction-type surface ohmic electrode (58) is disposed on the surface of a region other than a projective region of the pad electrode on a group-III crystal layer, and a window layer covers and is in contact with the surface of the group-III crystal layer on the entire projective region of the pad electrode. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the electrode at a position other than the projective region and the window layer in contact with the crystal layer on the entire projective region in the group III nitride crystal device of Ming-Jiunn in order to form a schottky barrier having good current blocking capability and therefore contribute to higher power output as stated by Lee in column 4, line 59 – column 5, line 20. Ming-Jiunn and Lee do not teach that the second conduction type-surface ohmic electrode is comprised of a plurality of electrodes. Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 a second conduction-type surface ohmic electrode (45) composed of a plurality of electrodes which are disposed on a surface of a region other than the projective region of the pad electrode on a group III nitride crystal layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the second conduction type surface ohmic electrode of Okazaki in the method of Ming-Jiunn and Lee in order to scatter the current and therefore emit more light than the prior art as stated by Okazaki in column 6, lines 7 – 10 and 49 – 53.

With regard to claim 12, Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 wherein the surface ohmic electrodes are disposed in a periphery of the pad electrode.

With regard to claim 13, Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 wherein the surface ohmic electrodes are disposed at a bilaterally symmetric position with respect to the center of the pad electrode.

With regard to claim 16, Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 wherein the surface ohmic electrodes are is disposed in an open light-emitting region other than a projective region of the pad electrode on the surface of the group-III nitride crystal layer.

With regard to claim 17, Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 wherein the sum of areas of surface ohmic electrodes is from 5 to 30% of a total area of the open light-emitting region.

With regard to claim 19, Ming-Jiunn discloses in figure 7 forming a surface ohmic electrode in contact with a surface of a gallium nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of hetero-junction structure. Ming-Jiunn discloses in figure 7 then covering the surface of the group-III nitride crystal layer and the surface ohmic electrode to form a window layer comprising an electrically conducting transparent oxide crystal layer conductive with the surface ohmic electrode. Ming-Jiunn discloses in figure 7 then forming a whole pad electrode for wire bonding on a center of the upper surface of the window layer conductive with the window layer. Ming-Jiunn does not teach that the second conduction –type surface ohmic electrode is disposed on a region other than the projective region and that the window layer

covers and is in contact with the surface of the group-III crystal layer on the entire projective region of the pad electrode. Lee teaches in figure 5a, and column 4, lines 59 – 20 a second conduction-type surface ohmic electrode (58) is disposed on the surface of a region other than a projective region of the pad electrode on a group-III crystal layer, and a window layer covers and is in contact with the surface of the group-III crystal layer on the entire projective region of the pad electrode. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the electrode at a position other than the projective region and the window layer in contact with the crystal layer on the entire projective region in the group III nitride crystal device of Ming-Jiunn in order to form a schottky barrier having good current blocking capability and therefore contribute to higher power output as stated by Lee in column 4, line 59 – column 5, line 20. Ming-Jiunn and Lee do not teach that the second conduction type-surface ohmic electrode is comprised of a plurality of electrodes. Okazaki teaches in figure 4, figure 5e, column 6, lines 6 – 9, and column 7, lines 57 – 58 a second conduction-type surface ohmic electrode (45) composed of a plurality of electrodes which are disposed on a surface of a region other than the projective region of the pad electrode on a group III nitride crystal layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the second conduction type surface ohmic electrode of Okazaki in the method of Ming-Jiunn and Lee in order to scatter the current and therefore emit more light than the prior art as stated by Okazaki in column 6, lines 7 – 10 and 49 – 53.

With regard to claim 20, Ming-Jiunn discloses in figure 7 wherein the pad electrode is formed on the group-III nitride crystal layer through a window layer comprising an electrically

conductive transparent oxide crystal layer so that the electrically conducting transparent oxide crystal layer is not present on the surface of the pad electrode used for wire bonding.

9. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ming-Jiunn, Lee, and Okazaki as applied to claim 11 above, and further in view of Bastek (USPAT 4232440).

It is not clear if Ming-Jiunn, Lee, and Okazaki teach wherein the surface ohmic electrodes are disposed at isometric positions from the center of the pad electrode. Bastek teaches in figure 3 wherein surface ohmic electrodes (16) are disposed at isometric positions from the center of a pad electrode (15). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the positioning of Bastek in the device of Ming-Jiunn, Lee, and Okazaki in order to make contact to a light emitting portion of a light emitting device with a high degree of reliability and with minimum interference with light emission.

Response to Arguments

10. Applicant's arguments with respect to claims 1 – 7, 11 – 17, 19, and 20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703) 308-6236. The examiner can normally be reached on 8:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
November 12, 2003

Tom Thomas

TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800